THE

YOUNG MECHANIC.

DECEMBER, 1833.

CHEMISTRY.

PROTOXIDE OF NITROGEN.

Nitrous Oxide—Gaseous Oxide of Azote—Exhilarating Gas—Dephlogisticated Nitrous air.

Protoxide of nitrogen is a colorless, elastic gas, possessing a slight odor and a sweet taste. It may be condensed to a liquid, as has been shown by Mr. Farraday, Phil. Trans. 1823. Its specific gravity air being 1, is 1·527.—100 cubic inches, weigh 46·57 grains.

It is a supporter of combustion; most substances burn in it with more energy than in the atmosphere. Water, freed from air, absorbs about 9-10ths its bulk of this gas at 60° F., and acquires a sweetish taste. It is absorbed also by ether, alcohol, and essential oils, in larger proportion than by water, and may be separated from them unchanged.

It was discovered by Dr. Priestly in 1772, and called by him dephlogisticated nitrous air. Its properties were elucidated by Sir Humphrey Davy, in 1799, and it received from him the name of nitrous oxide.

Composition.

By volume, 100 Nitrogen, 50 Oxygen,
By weight, 14 Nitrogen, 8 Oxygen,
Its atomic weight, $14 + 8 = 22$.

Preparation.

Protoxide of nitrogen cannot be formed by the direct union of its elements; but it may be obtained by a variety of processes in

which nitric oxide or nitric acid are decomposed by substances capable of abstracting a part of their oxygen. The most convenient and economical process is, by the decomposition of nitrate of ammonia by heat.

1. Introduce into a glass retort enough of the salt to fill about one third its bulk, and apply to it a heat of about 450° F. by means of an Argand lamp or portable furnace. When the nitrate of ammonia becomes liquid, bubbles of gas are given off, which may be collected over water, which will absorb the nitric oxide, should any of this gas be formed. Care must be taken that the temperature of the retort be not too great. This may be easily known by the gas which is generated becoming more transparent, and of a redish color, owing to the formation of nitric oxide. When heated to 7 or 800° F. a luminous appearance is presented, followed by an explosion.

THEORY OF THE PROCESS.—Nitrate of ammonia is composed of nitrogen, oxygen and hydrogen. During this process *all* the nitrogen, unites with a *part* of the oxygen, forming protoxide of nitrogen, and the remaining oxygen unites with the hydrogen, forming water. This will be rendered more clear by the following diagram, where the atomic proportions and weights are attached.

Nitrate of Ammonia 71 oz.	Nitric Acid, 1 prop. = 54 oz.	Nitrogen, 1 prop. = 14	= 54
		Oxygen, 5 prop. = 40	
	Ammonia, 1 prop. = 17 oz.	Nitrogen, 1 prop. = 14	= 17
		Hydrogen, 3 prop. = 3	
	71		71

Now the two proportions of nitrogen $(14 + 14 = 28)$ uniting with 2 proportions of oxygen $(8 + 8 = 16)$ form protoxide of nitrogen $= 44$.

The remaining 3 proportions of nitrogen $(8 + 8 + 8 = 24)$ uniting with the three proportions of hydrogen $(1 + 1 + 1 = 3)$ form water $= 27$, and $44 + 27 = 71$, the weight of the nitrate of ammonia.

2. Nitrous oxide may also be formed by exposing nitric oxide gas to the action of iron filings, or other substances, which have a strong affinity for oxygen. Sulphate of potass, muriate of tin, dry alkaline sulphurets and zinc effect this change.

3. When dry nitric oxide and dry sulphuretted hydrogen gasses are mixed together over mercury, a mutual decomposition slowly takes place, nitrous oxide and water are formed, and sulphur is deposited.

4. Nitrous oxide is produced during the solution of several of the metals in nitric acid. The gas in these cases is always mixed with nitric oxide, and often with nitrogen.

5. By heating a saturated solution of nitrate of iron, or distilling to dryness nitrate of zinc, protoxide of nitrogen is formed.

Protoxide of nitrogen may be decomposed by passing through it a succession of electric sparks; or by passing it through a tube

heated to redness. It has been analysed by Sir Humphrey Davy by means of hydrogen gas. A mixture of these two gasses being inflamed by an electric spark is converted into water and nitrogen, and hence, its composition may be easily determined.

The action of protoxide of nitrogen upon the animal system for several years after its discovery was unknown, and it was supposed to be irrespirable until the experiments of Sir Humphrey Davy proved its remarkable properties when respired. Warm blooded animals soon die when confined in it. When taken into the lungs it produces different effects upon different individuals, but generally a great excitement occasioning a rapid flow of vivid ideas,—a feeling of lightness, a propensity to laugh and to indulge in violent muscular action accompanied with a feeling of indifference or recklessness of consequences, a forgetfulness of the past and without thought of the future. The whole of the mind's attention becomes absorbed in itself, and it loses all recollection of every thing around. I cannot better describe the influence which this gas produces, from personal experience, than by saying that I enter upon a new existence, so totally different are my sensations from former ones ; an existence so pleasing that the past is forgotten, and as the influence of the gas gradually diminishes and I return to my former state, it appears as new to me, and my feeling of surprise is as great as though years had elapsed since I left it. What is particularly remarkable is, that after the influence of the gas is over, the individual does not feel the languor and depression of spirits which usually follows exhilaration from other causes; on the contrary he is usually rendered more cheerful for several hours after the violent effects of it have subsided, and in a few instances its influence has been felt for several days. These pleasing effects, however, are not always produced by nitrous oxide. Different individuals are differently affected. Persons of a plethoric habit, upon inhaling it, are affected by giddiness and languor, followed by headache and other disagreeable symptoms. Judgment therefore is required in administering it. Prof. Silliman states that of the multitude to whom he has administered it, about six out of eight have been agreeably affected. From the experience I have had, though limited, I am induced to doubt whether so large a proportion are unpleasantly affected. Of those to whom I have given it, or to whom I have seen it aministered, only two or three out of perhaps as many hundred, have spoken of their sensations as disagreeable. There is, however, a feeling of oppression at the lungs, not uncommon, when the gas is first inhaled, but this soon goes off, and I have never known it to prevent the individual from taking a second dose. Of the immense numbers who have inhaled it, it has, so far as my knowledge extends, never proved fatal in any instance, yet this is to be feared in the class of persons before mentioned.

The quantity usually respired is from four to six quarts, breathed from and into an oiled silk, or caoutchouc bag, or bladder, furnished with a stopcock and mouth piece with a bone of not less than one fourth of an inch diameter.

There is no satisfactory theory by which we can account for the action of protoxide of nitrogen upon the animal system. It cannot but be regretted, says Prof. Silliman, that so powerful a stimulus, both for our physical and intellectual powers, should remain a subject of mere curiosity or merriment. Differing from every other stimulus, in not producing depression correspondent to the excitement, why should it not be employed as a general tonic, and as a comforting reviving remedy? We shall conclude this article by giving an account of the effects of this gas upon a few individuals. Sir Humphrey Davy thus describes the effect it had upon himself:

'Having previously closed my nostrils, and exhausted my lungs, I breathed four quarts of nitrous oxide, from and into a silk bag. The first feelings were similar to those produced in the last experiment, (giddiness,) but in less than half a minute, the respiration being continued, they diminished gradually and were succeeded by a sensation analogous to gentle pressure on all the muscles, attended by a highly pleasurable thrilling, particularly in the chest and the extremities. The objects around me became dazzling, and my hearing more acute. Towards the last inspiration the thrilling increased, the sense of muscular power became greater, and at last an irresistible propensity to action was indulged in. I recollect but indistinctly what followed: I know that my motions were various and violent.'*

'Mr. Wedgwood breathed atmospheric air first, without knowing it was so. He declared it to have no effect, which confirmed him in his disbelief of the power of the gas. After breathing this sometime, however, he threw the bag from him, kept breathing on laboriously with an open mouth, holding his nose with his left hand, without power to take it away, though aware of the ludicrousness of his situation; all his muscles seemed to be thrown into vibrating motions; he had a violent inclination to make antic gestures, seemed lighter than the atmosphere, and as if about to mount. Before the experiment he was a good deal fatigued after a long ride, of which he permanently lost all sense.'*

The following case should serve to produce caution on the part of those who administer nitrous oxide. A student of Yale College, about nineteen years of age, of a sanguine temperament, and possessed of the most perfect health, breathed the gas, which was prepared and administered in the usual manner. Immediately his feelings were uncommonly elevated, so that (as he expresses it) 'he found it impossible to refrain from dancing and shouting.' Indeed, to such a degree was he excited, that he was thrown into

* Davy's Researches.

a frightful delirium, and his exertions became so violent, that after a while he sunk to the earth exhausted, and there remained until having by quiet in some degree recovered his strength, he again rose, only to renew the most convulsive muscular efforts and the most piercing screams and cries; within a few moments, overpowered by the intensity of the paroxysm, he again fell to the ground apparently senseless, and panting vehemently. For the space of two hours these symptoms continued; he was perfectly unconscious of what he was doing, and was in every respect like a maniac; he states, however, that his feelings vibrated between perfect happiness, and the most consummate misery. The effects remained in a degree for three or four days.

The effect which this gas had upon another member of the same college, a man of mature age and of a grave and respectable character, is described as follows:- For nearly two years previous to his taking the gas his health had been very delicate, and his mind frequently gloomy and depressed. This was peculiarly the case, for a few days immediately preceding that time; and his general state of health was such that he was obliged almost entirely to discontinue his studies, and was about to have recourse to medical assistance. In this state of bodily and mental debility he inspired about three quarts of nitrous oxide. The consequences were, an astonishing invigoration of his whole system, and the most exquisite perception of delight. These were manifested by an uncommon disposition for pleasantry and mirth, and by extraordinary muscular power. The effect of the gas was felt without diminution for at least *thirty hours*, and in a greater or less degree for more than a week.

But the most remarkable effect was that upon the organs of taste. Antecedently to taking the gas he exhibited no peculiar choice in the articles of food, but immediately subsequent to that event, he manifested a taste for such things only as were sweet, and for several days ate nothing but sweet cake. Indeed, this singular taste was carried to such excess, that he used sugar and molasses not only upon his bread and butter and lighter food, but upon his meat and vegetables. This he continues to do even at the present time, and although nearly eight weeks have elapsed since he inspired the gas, he is still found pouring molasses over beef, pork, poultry, potatoes, cabbage, or whatever animal or vegetable food is placed before him.

His health and spirits since that time have been uniformly good, and he attributes the restoration of his strength and mental energy to the influence of the nitrous oxide. He is entirely regular in his mind, and now experiences no uncommon exhilaration, but is habitually cheerful, while before, he was as habitually grave, and even to a degree gloomy.*

* Amer. Jour. Vol. 5.

BOOK-KEEPING.

It is said that when the Indian chief Black-hawk was introduced into the bank, he could not be made to comprehend the duties of the clerks with their pens. Doubtless, with his rude notions, he would have chosen some other method of keeping accounts than that adopted by the silent and busy accountants in the white man's great house for money.

The art of book-keeping is altogether useless to the savage, and unfortunately many of those who claim to be civilized, and to engage in affairs of business, value the art of keeping accounts by a systematic method almost as little as the untutored sons of the forest.

The principles of the art, as applied to the relations of debtor and creditor, between man and man, are so very simple that many suppose the art may be practised by a person of ordinary abilities without study. The consequence is, that all the advantages which might be derived from a knowledge of a perfect system are lost. It is true there is a cause for this besides the apathy of many respecting improvements of great importance. The text books relating to the subject have been adapted to the business of the wholesale merchant, and the necessary modifications to suit them to other business have not been given.

Men of learning, in whose hands the direction of education among the mass of community is placed, have not been aware of the utility of a knowledge of the principles of this useful art, and being themselves ignorant of it, have not recommended it.

Perhaps we should not exceed the bounds of probability, if we should conjecture that not one in five hundred of the young gentleman who graduate from our colleges are capable of taking charge of the accounts of any large establishment. It follows, as a matter of course, that when they are called to take the oversight of our academies and high schools, this branch of education is either entirely neglected, or taught in such a manner that no advantage is derived from it.

Persons who engage in mercantile affairs generally pay some attention to the art after they commence business, and by adopting the methods which they find to be customary with others in similar business, they are generally able to keep a tolerably correct account of their debts and credits. This may be done by a method called *single entry*, to distinguish it from the perfect system which is denominated the method by *double entry*.

But this method does not show the situation of the affairs of the owner of the property any farther than they depend on debts and credits. He therefore loses all the advantage to be derived from an accurate knowledge of his own resources, and the sources of his gains, or the cause of his losses. The want of perfection in

the method he pursues exposes him likewise to important errors, which are not always detected. It would indeed be a very great improvement in the mode of conducting business common with many *mechanics*, were they as careful of their accounts as even the more negligent of the merchants. But it often happens that at the commencement of business the mechanic, either from the circumstance of dealing for ready pay, or from the limited nature of his business, progresses for some time without perceiving the necessity of a careful attention to his accounts.

When his business becomes more extended, his attention and his time are too much occupied to allow him to learn a system, and a habit of trusting to his memory has already introduced some errors into his books. Still the habit is continued. Charges are sometimes neglected, credits are seldom given, settelments are made by *jumping*, his books are months behind in posting, the magnitude of the task of bringing them up prevents him from undertaking it while business presses, and thus he goes on from year to year. Suddenly, perhaps, he is taken away by death, his estate is represented insolvent, and, from the impossiblity of obtaining just settlements, is found to be so in fact. His family are left destitute. Those who have observed the customs of mechanics in regard to their accounts, and especially those who have been conversant with the settlement of their estates, can attest to the frequency of cases like these, except that the inadequacy sometimes overtakes them before death, and they are driven to the necessity of beginning the world again under many embarrassments and discouragements.

How frequently failures in business among the merchants arise from negligence in keeping or inspecting accounts, it is not so much our present object to inquire. That they might sometimes be avoided by attention to the subject, there can be no doubt.

Were the community aware of the importance of more attention to this subject, in the education of the young, the remedy would be easy. Instructers of youth would be required to qualify themselves for teaching the science, and every young man would be instructed to consider himself unprepared for active life till he should have made himself a master of the art. Till this shall be done, the workingmen will never take their proper rank in the community.

This subject may be resumed again, if an interest should be manifested in it, and a sketch of the history, and an outline of the principles of the art may be given. G.

PATENTS FOR MASSACHUSETTS.

Granted in March, 1833.

From the Journal of the Franklin Institute.

For an improvement in the mode of *Guiding all Endless Bands, Belts*, or *Aprons* while in motion; Samuel Sawyer, Boston, Massachusetts, March 30.

This is a simple, and, we have no doubt, an effective instrument. The endless band, or apron, passes over a roller, fixed in a suitable frame, and turning upon gudgeons. The frame has a centre pin on its lower side, which passes down into a hole, that allows the frame with its roller to swivel round. A shank, or rod, extends out at right angles from the frame of the roller, and at a suitable distance it is crossed by another piece forming two arms, parallel to, and of about the same length with, the roller. Each of these arms is bent over at the end, to receive and embrace the edges of the band, or apron. Should the band, in motion, now deviate either to one side or the other, its edge will press against the turned over end of one of the arms, which will immediately cant the roller, and right the band.

The whole is clearly explained, and distinctly represented in the drawing, but the specification refers to the model, which it claims as making a part of the patent.

For an improvement in the mode of *Cleaning aud Ginning Cotton Wool*, and freeing it from the seeds, &c.; Samuel Sawyer, Boston, Massachusetts, March 30.

Between tho two rollers, fixed in the manner of the ordinary roller gin, there is a third smaller roller, with its centres forward of them, and occupying nearly the whole of the gripe between them. Around this smaller roller passes an endless apron, and as the cotton is fed to, and drawn in forcibly between the gin rollers, the minuteness of the spaces causes all seeds and other hard substances to be completely squeezed out, whilst the cotton is carried in upon the endless apron, and is taken off by a revolving belt cleaner. The guide roller, described in the specification last referred to, is applied to the endless apron in this machine.

For an improvement in his method of *Cleaning and Ginning Cotton Wool;* Samuel Sawyer, Boston, Massachusetts, March 30.

This improvement consists in applying a plate, or blade, of metal or wood, in contact, or nearly so, with the small roller carrying the apron, as described in the last specification. The cotton being fed between the blade and the roller, is drawn in, and the seeds, &c. completely excluded. This blade, which is called a preventer, it is observed, may be advantageously applied to the common roller gin.

There is a strong resemblance in the principle of operation, though but little in the mode of fixture, between this blade and the guard mentioned as applied to the roller gin of the Messrs. Whittemore.

For a mode of *Combining Rollers, with a connecting Belt, or Apron, whereby Fleece, or Skin Wool, may be held or strained over a surface, so that foreign substances may be removed;* Samuel Sawyer, Boston, Massachusetts, March 30.

An endless apron is held up against a fluted roller, by two small rollers, over which it passes. The fluted roller allows burs, or other foreign substances, to pass between it and the apron without being crushed, and as the fleece passes over the smaller rollers, everything of the kind is exhibited to view, and readily brushed or knocked off. We should make our description much too prolix, were we to attempt a verbal explanation of the whole arrangement of this machinery. The guide roller is applied to the endless apron of the machine.

For machinery for *Cleaning Animal Wool &c.;* Samuel Couillon, Jr., Boston, Massachusetts, March 30.

The specification of this patent extends over eleven closely written pages, which might, however, be reduced to two, if the repetitions and other redundances were pruned away. We shall not attempt an analysis of the specification, and even the claim itself we shall condense very much. The former informs us that the object of the invention is the cleaning of animal wool from foreign substances, in the fleece, or otherwise ; and that for this purpose the fibres of said wool are to be straightened in such a manner as to bring the burs or other foreign materials on the surface, when they are to be removed 'by scraping, cutting, pinching, blowing, or striking them off, as hereinbefore specified.'

A further claim is to the mechanical arrangement of his machine, as described, with the exception of two small drawing rollers, invented by Samuel Sawyer, and used with his approbation.

The fleece is stretched by means of fluted or other rollers, over and between which it passes ; from them it is drawn against a straight metallic edge, in passing which, the fleece is beaten by a revolving beater having projections on it, which serve to disentangle the fibres, to straighten them, and remove the foreign substances.

There appears to be considerable resemblance between this machine and that last described, not only as regards the object in view, but also in the mode of accomplishing it.

ANSWER.

MESSRS EDITORS.—I believe there are several questions in the Young Mechanic that have not been answered; and as it would be well to have the answers as far as practicable in the same volume, I send you an answer to the question in the August number, namely, How the pressure of water against the turning gates of the Charlestown Dry Dock is calculated; whether we measure back from the gates one, two, three, four or five feet, or whether we take the whole extent of the ocean? It is also said that they sustain a pressure at high water of 800 tons.

In answering this question, there are two principles by which we must be governed. First, that the pressure of a liquid depends upon its height or depth, and also the extent of the surface exposed to its pressure; and secondly, that the pressure is exerted equally in all directions.

Upon inquiry I find that the height of the turning gates is 30 feet, and their breadth 32 feet each, making a surface of 1920 square feet, for the water to press against. I would remark here, that the full breadth of each gate is 33 feet; but owing to the construction of the hinges and junction of the gates, it was thought more correct to call it 32 feet, and although the gates are 30 feet high, the general height of the water is 27 feet, but it sometimes stands as high as 30 feet.

I shall make the calculation upon the supposition, that the depth of the water and height of the gates, are equal to 30 feet, and the breadth of the two gates 64 feet. Now, 64 multiplied by 30, gives 1920, the square feet of surface of the two gates; which must be multiplied by the average pressure on each square foot. It must be evident, that a square foot of surface at the lower part of the gates, sustains a greater pressure than the same extent of surface near the top. The fact is, that the average pressure, is equal to what the gates sustain at the centre, or half way up; that is, a pressure equal to that of a column of water 15 feet high.

A cubic foot of sea water weighs 64 pounds, and 15 times this or 960 pounds, is the weight of a column of water one foot square, and 15 feet high, which is the average pressure on every square foot; and 960 the pounds on each square foot, multiplied by 1920, the number of square feet, gives 1,843,200 pounds for the whole pressure; which being divided by 2,000, the pounds in a ton, gives 921 tons and 6 tenths, as the pressure sustained by said gates. The horizontal extent of the water back from the gates, must not be taken into the calculation.

PHILO.

INDEX TO VOLUME II.

	Page.
Area and boundaries of figures compared,	13
Answers	20, 36, 84, 190
Attraction,	26, 37
Architecture,	40, 58, 76, 107
Anderson's portable Kitchen,	49
Angles and Degrees,	55
Axe Factory, extensive one,	83
Atmosphere,	85
Anthracite Coal for Steam,	99
Accidents, results of,	114
Antiquity of Mechanical Science	175
Book-Keeping,	136
Busts to give the appearance of Marble,	34
Blowing of Glass by Machinery,	51
Burning Springs,	66
Boston Mechanics Lyceum,	68
Boston Gas Manufactory,	178
Chemistry,	8, 26, 37, 53, 69, 85, 101, 117, 133, 149, 165, 181
Convenient method of Guaging,	18
Clock, a curious one,	50
Color of the Air,	67
Chronometers, premium for,	83
Circle to measure	88. 103, 121
Concave mirror, deceptions with,	89
Cast Iron trinkets,	110
Cream, method of obtaining it,	153
Competitions among Mechanics,	158
Durability of Watches,	34
Degrees and Angles,	55
Dividing plate for a Lathe,	73
Dry Dock at Charlestown,	82
Decimal Fractions,	115
Essays on Knowledge,	17, 31
Excellence not limited by station,	123
Friction, to reduce	59
Franklin, Dr.	100
Fire Engines,	177
Guaging casks,	18
Geometry and Arithmetic.	13, 24, 41, 55, 71, 87, 103, 121, 145
Gas lights,	35
Glass blowing by Machinery,	51
Gunpowder applied to the arts,	116
Hale's patent,	15
Hainsselin Power Machine,	113
Huse's mode of working Fire Engines,	177
Invention and discovery,	19
Improvement in the Arts,	34
Inventions encouraged,	51
India rubber,	82
Incombustible Architecture,	93
Ignis Fatuus,	140
Iron, to preserve from rust,	164

Light, ... 9
Laws of Motion, ... 30
Law suit, ... 35
Leather to Varnish, ... 111
Lamberts Cane Rifle, ... 174
Miscellany, ... 34, 51, 80, 99, 114, 164
Mechanics' Lyceum, ... 68
Microscope, new pocket one, ... 79
Motion, Sympathy of, ... 83
Mechanics' Reading Room, ... 84
Microscope, beautiful experiments with, ... 115
Mechanics, ... 169
New Discovery, ... 47
Natural Curiosity, ... 83
New Demonstration, ... 161
Patent Office, ... 11
Parallelograms, ... 24
Patents, ... 32, 63, 76, 97, 108, 127, 142, 155, 170, 188
Powers and Proportions, ... 41
Perkins Jacob, ... 80
Patent Baker case, ... 80
Polygons, ... 87
Practical Science, ... 112
Pin Machine, ... 114
Polytechnic Society, ... 179
Questions, ... 20, 36, 52, 68, 84, 100, 132, 148, 164, 180
Rotary motion of the Earth, ... 16, 30, 46
Rolling Helix Lever Watches, ... 62
Rocks to remove from Rivers, ... 139
Science and Art, ... 5
Specific Gravities, ... 21
Ship Caulking, ... 34
Science, Utility of, to Mechanics, ... 44
Steam Engines, to calculate their power, ... 48
Steam Generator, Perkins's, ... 81
Sculpture in Ivory, ... 81
Saw, Improved one, ... 82
Simplified application of Steam, ... 91
Straight Edges, ... 92
Stocking Knitter, ... 99
Stone Cutting Machine, ... 105
Stone Splitting Screws, ... 129
Steamer Alligator, ... 144
Steam Omnibus, ... 162
" Tea-Kettle, ... 163
Sheet Iron Roofs, ... 164
Steel cut with Soft Iron, ... 173
Time, ... 19
Trust to Yourself, ... 176
Varnishing Leather, ... 111
Watches, ... 34, 62
Water in the Desert, ... 114
Water, properties of, ... 117, 133, 149
Wrench, improved one, ... 122
Water obstructed by Air in Pipes, ... 125